

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 21

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte HIROFUMI FUKUMOTO

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Appeal No. 1998-1681  
Application No. 08/523,075

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ON BRIEF

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Before KRATZ, TIMM, and DELMENDO, Administrative Patent Judges.  
KRATZ, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's refusal to allow claims 20-35 as amended after final rejection. No other claims are pending in this application.

BACKGROUND

Appellant's invention relates to a method for detecting gel substances formed in a photoresist on a substrate surface. An understanding of the invention can be derived from a reading of exemplary claims 20 and 26, which are reproduced below.

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20. A method for detecting gel substances formed in a photoresist on a substrate surface, comprising:  
applying a positive photoresist on the surface of a substrate;  
exposing the entire surface to which the photoresist was applied;  
removing the exposed photoresist;  
irradiating the substrate surface from which the photoresist has been removed with ultraviolet rays in an inactive atmosphere while heating the substrate surface at a temperature of from 150 to 250°C to allow a polymerization reaction to take place in any gel substances on the substrate surface;  
irradiating a laser beam on the substrate surface after the irradiation with ultraviolet rays and heating step; and  
intercepting light from the laser beam to detect whether a gel substance is present or not due to scattering of light by the gel substance.

26. A method of inspecting for gel substances formed in a photoresist on a substrate surface, comprising the steps of:  
applying a positive photoresist to the surface of a substrate;  
exposing the entire surface to which the photoresist was applied;  
removing the exposed photoresist;  
subjecting the exposed surface to etching, whereby any gel substances on the substrate act as a mask for the etching;  
intercepting light from the laser beam to detect whether a gel substance was present or not during the etching step due to scattering of light by protrusions generated by the etching step in which gel substances on the substrate act as a mask for the etching.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Lewis et al. (Lewis) 1989	4,824,769	Apr. 25,
Suzuki et al. (Suzuki) 1990	4,900,938	Feb. 13,
Muller et al. (Muller) 1993	5,252,881	Oct. 12,

Nakai et al. (Nakai), Japan Pat. Pub. No. 64-073242, published Mar. 17, 1989<sup>1</sup>

Miura, Japan Pat. Pub. No. 04-147641, published May. 21, 1992<sup>2</sup>  
Elliott, Integrated Circuit Fabrication Technology, McGraw-Hill (1982), pp. 6-9, 166-171, 210-213, 233-243, 282, 283 and 302-305.

Claims 26-33 and 35 stand rejected under 35 U.S.C. § 103 as being unpatentable over Elliott in view of Miura, Nakai and Lewis. Claims 26-35 stand rejected under 35 U.S.C. § 103 as being unpatentable over Elliott in view of Miura, Nakai, Lewis and Muller. Claims 20-25 stand rejected under 35 U.S.C. § 103 as being unpatentable over Miura in view of Suzuki and Elliott.

We refer to the briefs and the answer for a complete exposition of the opposing viewpoints expressed by appellant and the examiner.

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<sup>1</sup> All references to Nakai in this decision are to the English language translation thereof, of record.

<sup>2</sup> All references to Miura in this decision are to the English language translation thereof, of record.

OPINION

We have carefully considered all of the arguments advanced by appellant and the examiner and agree with appellant that the aforementioned rejections are not well founded. The § 103 rejections maintained by the examiner suffer from a lack of a careful comparison of what is being claimed with what is reasonably disclosed and suggested by the applied references. Accordingly, we will not sustain these rejections.

As explained by appellant (brief, pages 6 and 7), the appealed claims involve the treatment of substrate surfaces from which photoresist has been removed by particular techniques to detect whether gel substances are or were present thereon.

Appealed claims 26-35 are drawn to a method wherein the entire surface of a substrate to which photoresist is applied is exposed and the exposed photoresist is removed. Thereafter, the substrate exposed surface is subjected to an etching process with any gel substances remaining on that exposed surface functioning as a mask. Then, the substrate surface is irradiated with a laser beam and light from that

step is intercepted to determine whether a gel substance was present or not during the etching step. Intercepted scattered light from protrusions generated during the etching step as a result of the presence of any such gel substances act as a positive indication of the presence of such gel substances during the etch.

In flawed attempts at establishing the obviousness of appellant's techniques for inspecting for gel substances as set forth in independent claim 26 and the claims depending therefrom, the examiner relies on various excerpts from a book by Elliott together with Miura, Nakai and Lewis in a § 103 rejection of claims 26-33 and 35 and the examiner additionally relies on Muller in a separately stated § 103 rejection of claims 26-35.

The excerpts from the work of Elliott selected by the examiner include some pages from chapters 1, 8, 9, 10, 11 and 12 of the book entitled Integrated Circuit Fabrication Technology. According to the examiner (answer, page 4), Elliott describes a variety of conventional processes used in making integrated circuit devices including ". . . exposure, resist development, postbaking, etching and cleaning or

removal." Also the examiner refers to page 304 of that book, wherein Elliott describes methods for detecting residual monolayers of resist residues left on wafers after stripping.

Miura describes a method for inspecting photoresist film on a wafer wherein patterned photoresist is exposed and subsequently removed with a developer. Next, any gel decomposed material left on the wafer is detected by using a laser beam to irradiate the wafer. The presence of any gel decomposed material is determined by detecting scattered light resulting therefrom. See the fifth page of the English translation of record.

Nakai describes a method for determining defects or dust on a surface using sensors for detecting scattered light. Muller is concerned with microminiature electrical motors and their fabrication using thin-film materials as protectants during etching. Lewis describes a positive photoresist developer composition.

The examiner principally relies on Elliott, Miura and Nakai<sup>3</sup> (answer, page 5) in taking the position that an

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<sup>3</sup> The examiner has not shown how Lewis and the separately applied Muller make up for the deficiencies of Elliott, Nakai

ordinarily skilled artisan would have found it obvious to use the detecting methods of Nakai and Miura "to evaluate substrates/samples subjected to the conventional photolithographic processing taught by Elliott . . . ." The examiner (answer, page 5) further states that:

The teaching of Nakai et al. JP 1-73242 extends that of the other references, including Miura JP 4-147641, by teaching that not only [a]particulates on the substrate, but also topological features in the substrate can be detected using these optical means.

Like appellant, we disagree with the examiner's view regarding the scope of the prior art teachings and with the examiner's logic in attempting to piece together the cited references so as to allegedly arrive at the subject matter of appellant's claims. Concerning the rejections that apply to any of claims 26-35, we observe that the examiner has not shown that Elliott suggests the claimed steps of etching a substrate surface after removing the exposed photoresist followed by irradiating the so etched surface with a laser beam to determine whether gel substances were present or not

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and Miura with regard to a lack of teaching of all of the steps of independent claim 26.



during the etching. Nor has the examiner established that any of the secondary references applied make up for this deficiency.

From our perspective, Miura is the closest prior art reference that is applied by the examiner. However, Miura irradiates the wafer with a laser without describing or suggesting an etch of the wafer following the resist removal step and before the laser irradiation. See the fifth page of the English translation and figure 2 of Miura.

While the examiner (answer, pages 8 and 9) makes findings regarding advantages associated with detection of the etched substrate (unetched portion) versus detection of the gel itself, the examiner has not shown where those advantages are established as known in the cited prior art such that the prior art teachings alone would have fairly suggested, to one of ordinary skill in the art, modifying Elliott in a manner so as to arrive at the claimed process. Rather, the motivation relied upon by the examiner appears to come solely from the description of appellant's invention in their specification. Thus, the examiner used impermissible hindsight when rejecting the claims. See W.L. Gore & Associates v. Garlock, Inc., 721

F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984); In re Rothermel, 276 F.2d 393, 396, 125 USPQ 328, 331 (CCPA 1960). Consequently, we reverse the § 103 rejection of claims 26-33 and 35 over Elliott in view of Miura, Nakai and Lewis and the § 103 rejection of claims 26-35 over Elliott in view of Miura, Nakai, Lewis and Muller.

We now turn to appealed claims 20-25. Those claims are directed to a process including the steps of exposing the entire surface of a substrate to which photoresist was applied and removing the exposed photoresist. Then, ultraviolet rays and heat are used in irradiating the substrate surface after photoresist removal to allow polymerization of any gel substances that remain on the substrate surface. Thereafter, the ultraviolet ray irradiated substrate surface is irradiated with a laser beam. Light from the latter step is intercepted to determine whether a gel substance is present or not.

With regard to the examiner's § 103 rejection of claims 20-25 over Miura in view of Suzuki and Elliott, the examiner (answer, page 7) takes the position that:

It would have been obvious to one skilled in the art to postbake the positive resist in the process of Miura JP 4-147641 while concurrently irradiating the resist with UV light to harden the resist prior to further processing based upon the teachings to do so by Suzuki et al. '938 and Elliott "Integrated circuit fabrication technology" to maintain linewidth and ensure proper adhesion.

Even if we could agree with the examiner's proposed modification of the process of Miura (which we do not), the examiner has not satisfactorily explained how such a modification would result in appellant's process. This is so since the treatment of the substrate surface with UV rays and heat in appellant's process occurs after both exposure of the entire surface to which photoresist was applied and removal of the exposed photoresist. The examiner proposes to somehow modify the process of Miura to include heating and UV treatment of the resist of Miura based on the disparate teachings of the applied secondary references. Such a modification of Miura's process would result in baking (heating) and UV treatment of the substrate prior to resist removal, which is not in accord with the here claimed process. Accordingly, we will not sustain the examiner's § 103

rejection of claims 20-25 as being unpatentable over Miura in view of Suzuki and Elliott.

CONCLUSION

The decision of the examiner to reject claims 26-33 and 35 under 35 U.S.C. § 103 as being unpatentable over Elliott in view of Miura, Nakai and Lewis; to reject claims 26-35 under 35 U.S.C. § 103 as being unpatentable over Elliott in view of Miura, Nakai, Lewis and Muller; and to reject claims 20-25 under 35 U.S.C.

§ 103 as being unpatentable over Miura in view of Suzuki and Elliott is reversed.

REVERSED

PETER F. KRATZ	)	
Administrative Patent Judge	)	
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	)	
	)	
	)	BOARD OF PATENT
CATHERINE TIMM	)	APPEALS
Administrative Patent Judge	)	AND
	)	INTERFERENCES
	)	
	)	

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ROMULO H. DELMENDO )  
Administrative Patent Judge )

PFK/sld

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APPEAL NO. - JUDGE KRATZ  
APPLICATION NO.

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DECISION: **ED**

Prepared By:

**DRAFT TYPED:** 22 Aug 02

**FINAL TYPED:**